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A framework for leveraging artificial intelligence to improve industrial design practices

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Abstract:

A look at the nature of the relationship between technology and design, reveals that it is possible to say that the technologies developed in their various forms can have one or more effects on the design process, which include: a change in the nature of design inputs, a change in the nature of design outputs, a change in design practices. According to this point of view, we can say, artificial intelligence is one of those promising techniques that can bring about the three previous effects on different fields of design in general and the field of industrial design in particular, and there are many studies related to revealing these effects in the field of industrial design, some of them focus on the impact of artificial intelligence to improve design inputs by deepening A user study supported by artificial intelligence techniques and big data technology, and there are studies aimed to reveal the impact of artificial intelligence on the development of the innovative process, and others aimed to identify the impact of artificial intelligence on supporting the outputs of the design process itself.. Despite the multiplicity of studies supporting different aspects of design practices, there is no study that provides a comprehensive framework to achieve the maximum possible benefit in supporting the field of industrial design, and that is our main research problem, which is the lack of a comprehensive framework that discusses how to take advantage of artificial intelligence topics and techniques to support the practice of industrial design in general.The aim of this research is to determine the areas of benefit from artificial intelligence techniques to support and develop industrial design, then formulating this techniques into scalable framework that enables the industrial designer to benefit from artificial intelligence to improve design practices, and the hypothesis of the research is that, if it is possible to collect and analyze related studies How to benefit from artificial intelligence in the field of industrial design, it is possible to derive a general framework for how to benefit from the field of artificial intelligence to improve and develop industrial design, and for achieving this hypothesis, the research has adopted the inductive approach. In order to prepare the required framework, the study necessitated a simple introduction to the concept of artificial intelligence and a summary of its history, with a mention of the most important features of changes in the development of that technology, a review of the most important motives and driving areas for the development of the field of artificial intelligence, with a presentation of the most important areas of research for it, then presentation and discussion of a group of related studies In the fields of industrial design and artificial intelligence, in preparation for benefiting from them to prepare the targeted framework. In light of what was presented and discussed, it was possible to reach two points of view, one of which can be adopted as a primary basis to achieve the required framework, and they are as follows:

- The first claim is that artificial intelligence techniques will not affect the problem-solving methods and methodologies used in the field of design, and that design thinking will remain the approved approach to solving problems in the field of industrial design, and that only change will be limited to the tools used to achieve this. The second point of view, it claims that the change that artificial intelligence techniques will bring to the methods and methodologies for solving design problems will be radical to the extent that the design methodology will change completely, and the change will not be limited to tools and methods for solving problems, but will address the overall methodology used to achieve this. Depending on the last point of view, the research suggested a framework for taking advantage of artificial intelligence in fully improving industrial design practices, and this proposed framework consists of three main stages, in which the role of human intelligence represented by the designer is integrated with the role of artificial intelligence represented by computer technologies, and these stages include: The first stage: It is the research stage, the goal of this stage is to build a User-Product Model that matches the characteristics and personal characteristics of each expected user, which means identifying all characteristics to be achieved and percentages and degrees of achievement in each product to reflect the needs and requirements of its expected user, and the integration of the role of the designer and artificial intelligence at that stage is as follows:
    - The role of the designer, who determines the characteristics to be measured from the user's personality traits that affect the shape and function of the product, and determines the methods for measuring those characteristics.
    - The role of artificial intelligence techniques, which is to take advantage of big data technologies, the Internet of things, and the various sensors surrounding the user and integrated with many surrounding devices to measure the characteristics required to build the user-product model.
- The second stage: It is the **implementation stage**; the aim of this stage is to build a design output corresponding to the user-product model prepared in the previous stage.
- The third stage: It is the **matching stage**; the aim of this stage is to maximize the fitting of the design output with the user-product model. It is certain that the previous stage will end with reaching a copy of a product that closely matches the person's needs, but it is not certain that the ability of that copy to develop and

elevate the person's aspirations will It ends at that stage, and in this context.

Keywords:

Industrial design, Artificial Intelligence (AI), machine learning, a framework for design

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